

CLAIMS

What is claimed is:

1. An optical add/drop module for adding and dropping one or more channels from a wavelength division multiplexed (WDM) signal; the optical add/drop module comprising:

a drop portion configured to extract at least one optical channel from a multiplexed optical signal; and

an add portion having a plurality of stages including final stage in a cascade arrangement, each stage having at least one fused fiber interleaver, wherein the final stage that interleaves the most densely packed channels comprises a first fused fiber interleaver in series with a second fused fiber interleaver.

2. The optical add/drop module of claim 1, wherein the drop portion comprises a plurality of thin film filter interleavers.

3. The optical add/drop module of claim 2, wherein at least one of the thin film filter interleavers is configured to reflect a channel the multiplexed optical signal with a thin film filter while allowing other channels of the multiplexed optical signal to pass through the thin film filter.

4. The optical add/drop module of claim 2, wherein at least one of the thin film filter interleavers is configured to allow a channel from the multiplexed optical signal to pass through a thin film filter while reflecting other channels.

5. The optical add/drop module of claim 1, wherein at least one of the thin film filter interleavers is configured to deinterleave channels in the multiplexed optical signal by reflecting a plurality of channels using a thin film filter while allowing a plurality of channels to pass through the thin film filter.

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A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
1000 EAGLE GATE TOWER
60 EAST SOUTH TEMPLE
SALT LAKE CITY, UTAH 84111

6. An optical add/drop module for adding and dropping one or more channels from a wavelength division multiplexed (WDM) signal, the optical add/drop module comprising:

a drop portion a plurality of thin film filters, wherein each thin film filter drops a particular channel from a WDM signal;

an add portion that adds channels of the WDM signal dropped by the drop portion back to the WDM signal, wherein the add portion comprises:

a first stage of interleavers, wherein each interleaver in the first stage is a fused-fiber interleaver; and

a final stage including a thin film interleaver, wherein the thin film interleaver has a flat-top frequency response.

7. The optical add/drop module of claim 6, wherein each thin film filter of the drop portion is configured to reflect a particular channel from the WDM signal while allowing other channels to pass through the thin film filter.

8. The optical add/drop module of claim 6, wherein each thin film filter of the drop portion is configured to allow a particular channel to pass through the thin film filter while reflecting other channels.

9. The optical add/drop module of claim 6, wherein at least one of the thin film filters of the drop portion is configured to deinterleave a multiplexed signal by allowing a first group of channels to pass through the thin film filter while reflecting a second group of channels.

10. The optical add/drop module of claim 9, wherein each group of channels comprises alternating channels.

11. The optical add/drop module of claim 6, wherein the flat-top frequency response is essentially constant over a bandwidth about a defined carrier channel wavelength.

12. The optical add/drop module of claim 11, wherein the bandwidth is about $\pm 6\text{nm}$.

13. The optical add/drop module of claim 6, wherein the final stage exhibits isolation of channels at a bandwidth edge.

14. The optical add/drop module of claim 6, the thin film interleaver comprising:

a plurality of cavities, each cavity comprising one or more thin film layers and a spacer; and

a final cavity comprising a spacer that comprises a matching layer designed with an index of refraction intended to match the thin film interleaver to surrounding air or to another device.

15. An optical add/drop module for adding and dropping one or more channels from a coarse wavelength division multiplexed (CWDM) signal, the optical add/drop module comprising:

a drop portion configured to extract at least one optical channel from a multiplexed optical signal; and

an optical add portion comprising:

a plurality of interleavers disposed in stages, the stages in a cascade arrangement; and

a final stage that interleaves the most densely packed channels , the final stage including a thin film interleaver with a flat-top frequency response.

16. The optical add/drop module of claim 15, wherein the drop portion comprises a plurality of thin film three-port devices.

17. The optical add/drop module of claim 16, wherein each thin film three-port device of the drop portion is configured to reflect a particular channel from the CWDM signal while allowing other channels to pass through the thin film three-port device.

18. The optical add/drop module of claim 16, wherein each thin film three-port device of the drop portion is configured to allow a particular channel to pass through the thin film three-port device while reflecting other channels.

19. The optical add/drop module of claim 16, wherein at least one of the thin film three-port devices of the drop portion is configured to deinterleave a multiplexed signal by allowing a first group of channels to pass through the thin film three-port device while reflecting a second group of channels.

20. The optical add/drop module of claim 19, wherein each group comprises alternating channels.

21. The optical add/drop module of claim 15, wherein the flat-top frequency response is essentially constant over a bandwidth about a defined carrier channel wavelength.

22. The optical add/drop module of claim 21, wherein the bandwidth is about $\pm 6\text{nm}$.

23. The optical add/drop module of claim 15, wherein the final stage exhibits isolation of channels at a bandwidth edge.

24. The optical add/drop module of claim 15, the thin film interleaver comprising:

a plurality of cavities, each cavity comprising one or more thin film layers and a spacer; and

a final cavity comprising a spacer that comprises a matching layer designed with an index of refraction intended to match the thin film interleaver to surrounding air or to another device.

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60 EAST SOUTH TEMPLE
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25. An optical add/drop module for adding and dropping one or more channels from a coarse wavelength division multiplexed (CWDM) signal, the optical add/drop module comprising:

a drop portion the drop portion configured to extract at least one optical channel from a multiplexed optical signal;

an add portion, the add portion having a plurality of stages in a cascade arrangement, each stage comprising at least one fused fiber interleaver; and

a fused fiber interleaver in a final stage, the fused fiber interleaver in the final stage being less sensitive to temperature changes.

26. The optical add/drop module of claim 25, comprising a ceramic sleeve disposed about the fused fiber interleaver in the final stage.

27. The optical add/drop module of claim 26, the ceramic sleeve having a thermal coefficient of expansion that is opposite in magnitude to a thermal coefficient of expansion of the fused-fiber device.